TO: DNCT
FR: David Fullerton
RE: Additional Flexibility Concepts – Upstream Flows

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I have come up with several additional mechanisms by which the EWA might be able to generate greater environmental benefits for the same level of assets. I would like to hear your reaction to these ideas. If these are valid mechanisms, I would like to include them in future games.

My thinking is based upon several issues:

- I continue to believe that the EWA has been underprotecting the environment during dry years, primarily because we have been unable or unwilling to acquire and release upstream water during dry periods.
- We have yet to integrate EWA with the upstream water purchase program within the ERPP.
- The total cost of the environmental water acquisition program (EWA plus ERPP) is certain to become a major issue. If synergies exist, we need to quantify them as best we can.
- We have had a difficult time in backing water into upstream storage. We have done it, but the conditions under which it has been allowed are fairly constraining.

We have already utilized two mechanisms for acquiring upstream storage – couple exports with reduced upstream releases, and upstream purchases. I propose that we look at two additional mechanisms for shifting water into upstream storage from south of the Delta. The first is a sort of virtual transfer. The second is the sale of export water in order to fund upstream purchases. In both cases, I am attempting to overcome major limitations in infrastructure that hinder us from moving EWA to where it is most needed.

BALANCED EXCHANGES

This approach is based upon the premise that two diametrically opposed transfers of water will cancel out. Thus, we can use the fact that (1) export interests want to shift water from upstream storage into export areas while (2) the EWA may want to shift storage from south of the Delta into upstream storage.

Consider the following scenario: a bank in New York wants to transfer gold bullion to London. Simultaneously, a bank in London wants to move gold bullion to New York. They could each go to the expense of shipping the gold across the Atlantic. Or they could simply make a trade. In this way, they can both effect the transfer without any physical movement of the commodity.

More generally, whenever two parties wish to move an identical asset in diametrically opposite directions, they may simply exchange assets at the two ends. Moreover, each

side may gain reliability and reduce transportation charges. Indeed, this approach to generating upstream storage for the environment has distinct advantages, both for the environment and for water users.

In the games to date, we have only been able to back water up into storage from south of the Delta when (1) an export restriction required by the EWA coincided with (2) a period in which the Projects were making releases upstream above instream requirements for export south. The need for these two operations to overlap in time is very constraining. Moreover, it only allows us to back up water into state and federal reservoirs. Other reservoirs remain difficult to access.

I suggest that we should be able to relax this requirement. *Whenever someone who controls water north of the Delta (whether the Projects or a water purchaser in the export area) expects to move water from upstream storage to south of the Delta, then the EWA should be able to make a trade for that upstream stored water using water it already controls south of the Delta.*

For example, assume that in March, the SWP can predict that it will move 60 kaf of water out of Oroville Reservoir in August to meet contractual demands. If so, then the EWA could make a deal with the SWP to trade 60 kaf of EWA water already stored south of the Delta in return for 60 kaf in Oroville. This water could then be used to meet the ERPP flow target on the Feather for a 10 day pulse flow during March. Some of the 60 kaf released for the pulse might be pumped in the Delta to replenish the EWA account. Another part might be backed (via reduced release during the pulse flow) into another upstream reservoir to help support another upstream pulse. The remainder would go to Delta outflow (with the possibility that the EWA might claim an upstream credit if the extra outflow gave the Projects additional carryover X2 credits for the next month).

The idea works just as well using water transfers. If WWD made a deal with Western Canal to move water out of Oroville during the summer, then the same exchange could take place. WWD could get EWA water and the EWA could get the Western Canal water. Making exchanges based upon north/south transfers also provides a mechanism to generate storage at non project reservoirs.

The net impact on the environment from this deal would depend on the actual way the water was managed. In the least beneficial exchange, the EWA would probably just allow the water to flow out of the Delta during March. In that case, the environmental benefit/cost calculation would go something like this:

> Net Benefit = value of upstream release in March + value of increased Delta outflow in March + value of summer export pumping now foregone – the cost (either monetary or in terms of entrainment) of the EWA water given to the exporters.

The Net Benefit might increase if we were able to redivert some of the March pulse water or could back it into another upstream reservoir to support another instream pulse.

What the equation shows is that, if upstream flows are very important or if the EWA can export water at a low monetary or environmental cost, then this sort of trade could be very favorable to the EWA (and for the ERPP flow program). It is probably advantageous to the Projects as well, in that it will reduce pumping during periods of higher salinity. Finally, it is a mechanism for water purchasers to eliminate the uncertainty that Project infrastructure will be available when the transfer takes place and the need to pay for carriage water.

The main limitation on this approach will be in dry years, when the Projects may not be releasing any water specifically for export, but instead are simply making minimum releases from upstream reservoirs in order to meet environmental requirements. However, in such years, the water market is likely to be particularly active, thus increasing the opportunity for the EWA to make trades with water buyers in the export area. Another limitation is that water transfers are not always translatable into control over upstream storage.

MONEY TRANSFERS

To return to the gold analogy. Even if the New York bank could not find a London bank to trade gold with, it could still shift gold to London without physically having to shift gold across the Atlantic. It could sell gold in New York, then transport the money (by wire) across the ocean, then buy more gold in London. That is, provided that the same commodity is available in two locations and that a market exists in both locations, we may overcome limitations on transportability by converting the commodity into money, then reconverting back into the commodity at the other end.

There is nothing all that new in this idea. We have already purchased water with money in upstream areas. My only point is that, if we decide that having water in upstream reservoirs is more valuable than having water in export storage, then we can and should transfer the water upstream. Here are some reasons why we may wish to sell export area water to generate upstream storage (these same arguments generally apply as well to virtual transfers, discussed above):

- Upstream water is generally cheaper. We should be able to get perhaps twice as much water upstream as we sell in the export areas.
- The need to enhance upstream flows is very acute. Indeed, I believe that there is much less scientific dispute about the importance of instream flows than there is about the damage caused by exports.
- Upstream water can frequently be recaptured in the Delta by the EWA at low cost.
- Upstream water not captured by the EWA will often be useful as outflow.

RECOMMENDATION

I recommend that we begin to integrate ERP flow targets into the game on a few tributaries to begin assessing (1) the feasibility of integrating ERP targets within the EWA and (2) the cost savings available by operating the two water programs in tandem.

For example, we might select the American, Feather, and Stanislaus Rivers. We would then purchase water upstream (including selling EWA assets to fund the purchase), back water upstream, and exchange assets for upstream storage in order to meet the ERPP targets on these rivers.

I hope that we can discuss this at the next DNCT meeting.